UNIVERSITI TEKNOLOGI MARA

FABRICATION OF TITANIA-BASED MEMRISTIVE DEVICE USING RF MAGNETRON SPUTTERING METHOD

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Electrical Engineering

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The reported memristive device fabrication methods that offer precise deposition technique are expensive and include of multiple fabrication steps. It is also lack of exposition on how to improve the memristive behavior in terms of creating the oxygen vacancies in its active layer, and to relate the ionic mechanism to the I-V hysteresis loop. This work demonstrated a simple and effective process of memristive device fabrication using RF magnetron sputtering method. A study on the effect of different processes in fabricating titania active layer with lower oxygen content using three different methods which are plasma treatment, HF-etch and annealing process was carried out. This work also consists of a study on a few different fabrication structures and how the I-V hysteresis curve of each device structure can be explained in a number of mobile ionic movement mechanisms. The physical properties of the fabrication were analyzed using Field Emission Scanning Electron Microscope (FESEM) with Energy Dispersive X-ray Spectroscopy (EDS) system embedded, Atomic Force Microscopy (AFM) and Surface Profiler (SP). The memristive behavior current-voltage (I-V) measurement was conducted using 2-Point Probe with a voltage sweep from 0 V to -5 V, -5 V to 5 V then back to 0 V and another voltage sweep from -5 V to 5 V then back to -5 V. From the work done, we managed to identify the best fabrication device structure that also exhibit good memristive behavior.

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